IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Patent Application of : Marc SCHAEPKENS, et al.

Serial No.: 10/779,373 Art Unit: 1773

Filed: 17 February 2004 Examiner: Kevin R. Kruer

Title: COMPOSITE ARTICLE HAVING DIFFUSION BARRIERS AND DEVICES INCORPORATING THE SAME

DECLARATION UNDER 37 CFR § 1.132

I, Min (Martin) Yan, hereby declare as follows:

1. I have a Ph.D. degree in Materials Science and Engineering from Northwestern University in Evanston, Illinois, U.S.A., a M.S. degree in Materials Science from Shanghai Jiao Tong University in Shanghai, PRC and a B.S. degree in Materials Science from Shanghai Jiao Tong University in Shanghai, PRC. During my academic career, I concentrated my studies on vacuum coatings and thin film growth. I have been working in the field of barrier layers, including diffusion-inhibiting barrier layers for more than five years. Particularly, I have been working with diffusion-inhibiting barrier layers having a composition which varies substantially continuously across a thickness of the layer and have published a number of papers on that subject (copies of which are attached) including the following:

(a) Min Yan, Tae Won Kim, Ahmet Gün Erlat, Matthew Pellow, Donald F. Foust, Jie Liu, Marc, Schaepkens, Christian M. Heller, Paul A. McConnelee, Thomas P.

Feist, And Anil R. Duggal, "A Transparent, High Barrier, and High Heat Substrate for Organic Electronics", Proceedings of The IEEE, 93 (8), 1468-1477 (2005).

(b) Tae Won Kim, Min Yan, Ahmet Gün Erlat, Paul A. McConnelee, Mathew Pellow, John Deluca, Thomas P. Feist, and Anil R. Duggal, "Transparent hybrid inorganic/organic barrier coatings for plastic organic light-emitting diode substrates", Journal of Vacuum Science & Technology A: Vacuum, Surfaces, and Films, 23:(4), 971-977 (2005).

I am intimately familiar with diffusion-inhibiting barrier layers and thoroughly knowledgeable with the meaning of the terminology "varying substantially continuously across a thickness" as it applies to diffusion-inhibiting barrier layers.

2. I understand that independent Claim 1 of the instant application currently reads as follows:

> 1. A composite article comprising a first polymeric substrate layer and a second polymeric substrate layer, each of said polymeric substrate layers having at least a diffusion-inhibiting barrier disposed on a surface thereof, wherein the diffusion-inhibiting barriers on said substrate layers face each other within said composite article and **at least one of said diffusion-inhibiting barriers comprises a material, the composition of which varies substantially continuously across a thickness thereof**, and wherein compositions of regions across a thickness of said at least one diffusion-inhibiting barrier are selected from the group consisting of organic materials and inorganic materials.
> (emphasis added)

3. I further understand that independent Claim 8 of the instant application currently reads as follows:

> 8. An apparatus comprising:
> (a) a composite article that comprises a first polymeric substrate layer and a second polymeric substrate layer, each of said polymeric substrate layers having at least a diffusion-inhibiting barrier disposed on a surface thereof, wherein the diffusion-inhibiting barriers on said substrate layers face each other within said composite article; and
> (b) an electronic device disposed on said composite article, wherein **at least one of said diffusion-inhibiting barriers comprises a material, the composition of which varies substantially continuously across a thickness thereof**, and wherein compositions of regions across a thickness of said at least one diffusion-inhibiting barrier are selected from the group consisting of organic materials and inorganic materials.
> (emphasis added)

Each of the two independent claims includes the limitation "at least one of said diffusion-inhibiting barriers comprises a material, the composition of which varies substantially continuously across a thickness thereof".

4. Additionally, I understand that each of the two independent claims stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Chung, et al. (U.S. Patent No. 6,836,070, hereinafter "Chung") in view of Moser (U.S. Patent Application Pub. No. US2003/0148139, hereinafter "Moser") and Chopra (U.S. Patent No. 6,413,858, hereinafter "Chopra"). Additionally, Claims 1, 4-8, and 11-14 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Graff, et al. (U.S. Patent No. 6,492,026, hereinafter "Graff") in view of Moser and Chopra. Furthermore, the two independent claims stand rejected under 35 U.S.C. § 103(a) as unpatentable over Silvernail (U.S. Patent No. 6,576,351, hereinafter "Silvernail") in view of Moser and Chopra. The examiner groups the rejections into three groups based on the three primary references

(Chung, Graff, and Silvernail). Each of the three groups relies on secondary references Moser and Chopra to support the obviousness rejection: Moser for (a) the limitation of **an organic polymer layer varying substantially continuously across a thickness of the diffusion barrier** ("Limitation A"), or Chopra for (b) the limitation of an **inorganic layer varying substantially continuously across a thickness of the diffusion barrier** ("Limitation B").

5. Regarding the diffusion barrier layer in Moser, the examiner relies on Moser to show a continuously varying organic polymer layer (Limitation A). Moser requires "metal-containing particles . . . formed as individual grains or as a conglomerate of several grains" (*see* Moser *at* [0011]) (emphasis added) where the metal-containing particles are dispersed in an organic layer matrix. Moser also discloses, at [0016], that "the concentration of metal-containing components decreases as the thickness of the protection and/or diffusion barrier layer increases, in particular the metal particles diminish continuously in the direction of the surface" in order to affect the electrical conductivity of the barrier layer. In other words, Moser teaches a suspension of metal particles in an organic layer matrix that allows the designer to tailor the electrical properties of the layer. While there appears to be a gradient of discrete particles in the Moser diffusion layer, this is not a layer where the composition of the layer varies substantially continuously across a thickness of the layer, as is that term is known in the art. Indeed, there is no disclosure anywhere in Moser that indicates that the organic layer varies substantially continuously across a thickness of the layer. Rather, it is a "matrix" the composition of which is constant throughout the thickness of the layer. Instead,

Moser's diffusion layer is like a suspension. Moser teaches step-wise discontinuities of metal particles in an organic layer matrix that is constant throughout the thickness of the diffusion layer.

6. The present application discloses and claims a diffusion-inhibiting barrier layer where the composition of the layer varies substantially continuously across a thickness of the layer.

(a) The Example on page 11 (paragraph [0035]) of the application discloses an embodiment of a layer with a continuously-varying composition across a thickness: "a graded (inorganic/organic) barrier coating with a composition that was initially inorganic in nature, then continuously changed into a dominantly organic nature, and finally changed back to an inorganic nature."

(b) Paragraph [0028] discloses another embodiment which illustrates a layer with a continuously-varying composition across a thickness: "In one embodiment, a graded composition of the coating is obtained by changing the compositions of the reactants fed into the reactor chamber during the deposition of reaction products to form the coating. Varying the relative supply rates or changing the identities of the reacting species results in a diffusion-inhibiting barrier or coating that has a graded composition across its thickness."

(c) Figure 4 of U.S. Patent No. 7,015,640 issued to Schaepkens, et al. (U.S. Application No. 10/065,018), which is incorporated by reference in the instant application, shows a further example of a diffusion-inhibiting layer having a composition which varies substantially continuously across a thickness of the layer. As described in

the Schaepkens patent at col. 6 lines 62-66, Figure 4 shows the composition of the coating as a function of sputtering time which is related directly to the depth of the coating. As can be seen from Figure 4, the composition of the components of carbon, silicon, and nitrogen vary across the thickness of the coating.

The embodiments described in 6(a), 6(b), and 6(c) are examples of the meaning in the art of the terminology of a diffusion-inhibiting barrier comprising a material, the composition of which varies substantially continuously across a thickness thereof.

7. Therefore, the diffusion barrier layer in Moser is not a layer for which the composition varies substantially continuously across a thickness of the layer, as that term is understood in the art.

8. I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Title 18, United States Code, Section 1001, and that such willful false statements may jeopardize the validity of the above-identified application or any patent issuing thereon.

Respectfully submitted,

DATE: 06/04/2007

Min (Martin) Yan